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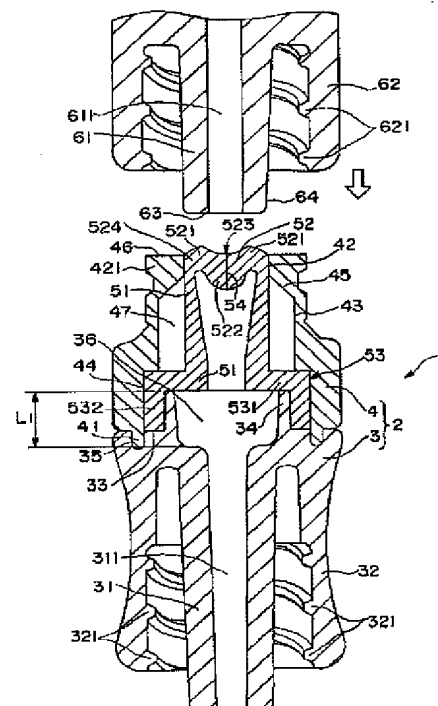
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(54) 【発明の名称】 コネクタ

(57) 【要約】

【課題】 管体の接続時にコネクタ内の流体通路が汚染されることなく、管体とコネクタとを確実に接続でき、管体接続時や管体をコネクタから外した後の液漏れを防止することができるコネクタを提供すること。

【解決手段】 コネクタ1は、管体6を接続する接続口である小径部42を有するハウジング2と、ハウジング2内に設置された弾性材料からなる弁体5とを備える。弁体5は、筒状の基体部51と、管体6に押圧される被押圧部52と、固定部53とを有する。被押圧部52には、自然状態では閉塞状態をなすスリット部54が形成されている。ハウジング2内には、逃げ空間36および間隙47が形成されている。管体6が被押圧部52を押圧してコネクタ1に接続されたとき、弁体5が変形して、スリット部54が開くとともに、基体部51の先端部および固定部53の一部が逃げ空間36に入り込む。



# PATENT ABSTRACTS OF JAPAN

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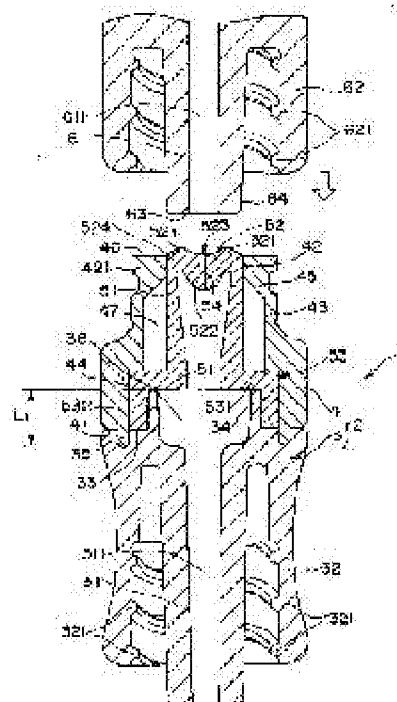
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## (54) CONNECTOR

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a connector capable of being certainly connected to a pipe member without contaminating the fluid passage in the connector at the time of connection to the pipe member and capable of preventing the leak of a liquid at the time of connection to the pipe member or after the pipe member is detached from the connector.

**SOLUTION:** The connector 1 is equipped with a housing 2 having a small diameter part 42 which is a connection port for connecting the pipe member 6 and the valve disc 5, which comprises an elastic material, arranged in the housing 2. The valve disc 5 has a cylindrical substrate part 51, the press part 52 pressed to the pipe member 6 and a fixed part 53. A slit part 54 closed in a natural state is formed to the press part 52. An escape space 36 and a gap 47 are formed in the housing 2. When the pipe member 6 presses the press part 52 to be connected to the connector 1, the valve disc 5 is deformed to open the slit part 54, and the leading end of the substrate part 51 and a part of the fixed part 53 enter the escape space 36.



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**CLAIMS**

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[Claim(s)]

[Claim 1]Housing which has an end connection which connects a shell and formed a fluid channel in an inside.

A valve element which was installed in said housing and comprised a spring material.

A suppressed area which it is the connector provided with the above, and said valve element is provided in the end side of a tubed base substance part and shaft orientations of said base substance part, contacts said shell, and receives thrust, A slit part which carries out an opening when it is formed in said suppressed area and said suppressed area is pressed, It is provided in the other end side of shaft orientations of said base substance part, have a holding part which fixes said valve element to said housing, and in said housing, When escape space which can insert a part by the side of a holding part of said base substance part is formed, said shell presses said suppressed area of said valve element and it is connected to said end connection of said housing, While elastic deformation of said valve element is carried out and said slit part carries out an opening, it is constituted so that a part by the side of a holding part of said base substance part may enter said escape space.

[Claim 2]The connector according to claim 1 constituted so that said base substance part may be compressed by shaft orientations and may expand the diameter, when said shell presses said suppressed area of said valve element.

[Claim 3]The connector according to claim 1 or 2 which has a gap which permits diameter expansion of said base substance part between said base substance part and said housing.

[Claim 4]The connector according to any one of claims 1 to 3 constituted so that said valve element may revert to the original shape when connection with said end connection of said shell is canceled.

[Claim 5]The connector according to any one of claims 1 to 4 to which said suppressed area has heights and/or a crevice in a side which said shell contacts.

[Claim 6]The connector according to any one of claims 1 to 5 to which said suppressed area has heights in a side which said shell does not contact.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention is used for various medical equipment, a transfusion container, a liquid-sending instrument, etc., for example, and relates to the connector for connecting a shell.

[0002]

[Description of the Prior Art]This conventional kind of connector is provided with housing and the valve element which consists of a spring material attached to the end connection of this housing, and he is trying to connect a shell and a connector certainly by this valve element. And flowing fluid (fluid etc.) is sent for the inside of a shell in a connector.

[0003]Conventionally, as the 1st example of this kind of connector, what is indicated by JP,8-243092,A, for example is known. When a shell is connected to a connector, it is made for a shell to penetrate the opening hole beforehand formed in the valve element in a connector in this connector.

[0004]As the 2nd example, what is indicated by JP,9-108361,A, for example is known. The small breakthrough is formed in the end face side side of the valve element attached in housing in this connector. And when a shell is connected to a connector, by forcing the apical surface of a shell on the end face side of a valve element, a valve element carries out elastic deformation, and it is formed so that the breakthrough of a valve element may spread by this.

[0005]

[Problem(s) to be Solved by the Invention]However, in the conventional above-mentioned connector, there was a problem that the path of the opening hole formed in the valve element will spread too much, by said 1st example. Since the opening hole was formed beforehand, when a shell was removed from a connector, there was a problem that liquid may flow backwards and leak from the end face side of a connector. Since the tip part of the shell was the structure of having penetrated a valve element and entering in a connector, there was a problem that the bacteria adhering to the tip part of a shell invaded in the fluid channel of a connector, and there was a possibility of polluting.

[0006]On the other hand, at said 2nd example, since it is the structure where a shell does not penetrate a valve element, there is no problem like the 1st above-mentioned example. However, are the apical surface of a shell the structure forced on the end face side of a valve element, and those fluid-tight nature, If it did not continue pushing by strong power while there was a possibility that liquid leakage might arise when the internal pressure of a connector became high since it was dependent on the contact pressure of the apical surface of a shell, and the end face side of a valve element chiefly, there was a problem that there was a possibility that connection between a shell and a valve element may separate depending on the grade of fitting of both.

[0007]Therefore, the purpose of this invention is to provide the connector which can prevent the liquid leakage after being able to connect a shell and a connector certainly and removing the time of shell connection, and a shell from a connector without polluting the fluid channel in a connector at the time of connection of a shell.

[0008]

[Means for Solving the Problem]Such a purpose is attained by this invention of following the (1) - (6).

[0009](1) Housing which has an end connection which connects a shell and formed a fluid channel in an inside, Are a valve element which was installed in said housing and comprised a spring material a connector

which it has, and said valve element, A tubed base substance part and a suppressed area which is provided in the end side of shaft orientations of said base substance part, contacts said shell, and receives thrust, A slit part which carries out an opening when it is formed in said suppressed area and said suppressed area is pressed, It is provided in the other end side of shaft orientations of said base substance part, have a holding part which fixes said valve element to said housing, and in said housing, When escape space which can insert a part by the side of a holding part of said base substance part is formed, said shell presses said suppressed area of said valve element and it is connected to said end connection of said housing, A connector, wherein it is constituted so that a part by the side of a holding part of said base substance part may enter said escape space while elastic deformation of said valve element is carried out and said slit part carries out an opening.

[0010](2) A connector given in the above (1) constituted so that said base substance part may be compressed by shaft orientations and may expand the diameter, when said shell presses said suppressed area of said valve element.

[0011](3) A connector the above (1) which has a gap which permits diameter expansion of said base substance part between said base substance part and said housing, or given in (2).

[0012](4) A connector the above (1) constituted so that said valve element may revert to the original shape when connection with said end connection of said shell is canceled thru/or given in either of (3).

[0013](5) A connector the above (1) in which said suppressed area has heights and/or a crevice in a side which said shell contacts thru/or given in either of (4).

[0014](6) A connector the above (1) in which said suppressed area has heights in a side which said shell does not contact thru/or given in either of (5).

[0015]

[Embodiment of the Invention]Hereafter, the connector of this invention is explained in detail based on the suitable embodiment shown in an accompanying drawing.

[0016]Drawing of longitudinal section and drawing 2 in which drawing 1 is one embodiment of the connector by this invention, and the state where the shell is not connected is shown, Drawing of longitudinal section and drawing 3 which cut the connector 1 of the state which shows in drawing 1 in the section of drawing 1 and the section which intersects perpendicularly, The top view, drawing 4, or drawing 6 which looked at the connector shown in drawing 1 from the end face side is drawing of longitudinal section equivalent to drawing 1, and the figure for explaining order for a state in case the shell 6 is connected later on, and drawing 7 are drawings of longitudinal section showing other embodiments of the connector of this invention. In the following explanation, a "end face" and the bottom are called "tip" and a sliding direction is called "shaft orientations" for the upper part in drawing 1, drawing 2 and drawing 4 – drawing 6.

[0017]The connector 1 shown in drawing 1 – drawing 3 is provided with the following.

The shell 6 is connected and it is the housing 2.

Valve element 5.

[0018]The housing 2 is provided with the housing body 3 and the covering device 4, and the fluid channel is formed in the inside, respectively.

[0019]The housing body 3 is provided with the following.

The approximately cylindrical inner portion (container liner) 31.

The approximately cylindrical lateral part (outer case) 32 provided in the periphery side of this inner portion 31 in same mind.

[0020]In the inner portion 31, the channel 311 is formed along with the longitudinal direction. The tapered surface which the outer diameter dwindle toward a tip from a end face is formed in the periphery of the inner portion 31. That is, the peripheral face of the inner portion 31 is making lure tapered shape. The tip of the inner portion 31 is further extended and provided in the direction of a tip rather than the tip of the lateral part 32.

[0021]The lateral part 32 is a portion used as a lure lock part, and the spiral screw thread (lure lock screw) 321 is formed in the inner skin.

[0022]the tube (not shown) etc. which have flexibility, for example pass direct or a predetermined splicer at the tip side of this housing body 3 — liquid — it is connected densely and, thereby, the fluid channel of the

connector 1 and the lumen of a tube are open for free passage. As this tube, the tube of an infusion set, etc. are mentioned, for example.

[0023]In order to connect a tube to the tip side of the housing body 3, for example, the inner portion 31 is made to insert in a tube.

[0024]While making the inner portion 31 insert in a tube, the flange or lure lock screw which a tubeside does not illustrate is made to screw in the screw thread 321, and is locked.

[0025]In this invention, the lateral part 32 and its screw thread 321 may be omitted. In this invention, the outer diameter of the inner portion 31 may be constant to shaft orientations (longitudinal direction).

[0026]It is provided in the end face of the housing body 3 so that the cylindrical valve element holding part 34 may project in the direction of a end face from the end face side 33. The inside diameter of the valve element holding part 34 is larger than the inside diameter of the inner portion 31. The inside of this valve element holding part 34 serves as the escape space 36 of the valve element 5 (base substance part 51).

[0027]The base end (the near end face side 33) of the channel 311 is the inside diameter limb expanded so that the inside diameter might become almost the same as the inside diameter of the valve element holding part 34. This inside diameter limb also escapes and a part of space 36 is constituted.

[0028]As shown in drawing 7, such a valve element holding part 34 does not need to be formed. In this case, in the state which shows in drawing 7, the whole space (space by the side of the tip of the base substance part 51) surrounded by the level difference part 531 and the sandwiching part 532 of the valve element 5 which are mentioned later escapes, and it becomes the space 36.

[0029]The slot 35 more nearly annular than the valve element holding part 34 to the periphery side is established in the end face side 33 of the housing body 3. The valve element holding part 34 and the slot 35 are formed in same mind with the inner portion 31 and the lateral part 32.

[0030]The covering device 4 has the space which stores the valve element 5 inside, and is connected with the end face side of the housing body 3.

[0031]The annular lobe 41 is formed at the tip of the covering device 4. This lobe 41 inserts into the slot 35 of the housing body 3, and it is in the state where the housing body 3 and the covering device 4 joined together.

[0032]Especially as a fixing method of the housing body 3 and the covering device 4, although not limited, weld of fitting, a caulking, adhesion by adhesives, thermal melting arrival, ultrasonic fusion, etc., etc. are mentioned, for example.

[0033]The inside diameter of the covering device 4 is divided into a three-stage, and has the narrow diameter portion 42, the medium diameter portion 43, and the major diameter 44 from the end face side, respectively. The taper part 45 is formed between the narrow diameter portion 42 and the medium diameter portion 43. The inside diameter of the taper part 45 is increased gradually toward a tip from the end face.

[0034]The narrow diameter portion 42 is a portion used as the end connection (terminal area) for connecting the shell 6 (maintenance).

[0035]The screw thread (lure lock screw) 421 is formed in the peripheral face of the narrow diameter portion 42. When screwing this screw thread 421 in the screw thread (lure lock screw) 621 of the lateral part 62 of the shell 6 mentioned later and connecting the shell 6 to the connector 1 (end connection), the shell 6 is locked by this screwing to the covering device 4.

[0036]The medium diameter portion 43 is a portion which stores the base substance part 51 of the valve element 5. The inside diameter of the medium diameter portion 43 is set up more greatly than the outer diameter of the base substance part 51 of the valve element 5, and the gap (escape space) 47 is formed between the medium diameter portion 43 and the base substance part 51 of the valve element 5. This gap 47 serves as space (diameter expansion permission space) which permits the base substance part 51 being compressed by shaft orientations by connection of the shell 6, and expanding the diameter so that it may mention later. By forming this gap 47, the flexibility of displacement and modification of the valve element 5 increases further, the valve element 5 operates certainly with connection and its release of the shell 6, and the slit part 54 opens [ in addition to the escape space 36 mentioned above ] and closes certainly.

[0037]The inside diameter of the major diameter 44 is set up more greatly than the outer diameter of the valve element holding part 34 of the housing body 3. The major diameter 44 is a portion which pinches the holding part 53 of the valve element 5 with the valve element holding part 34 of the housing body 3.

[0038]As a component of the covering device 4 and the housing body 3, For example, polyethylene,

polypropylene, ethylene propylene rubber, Polyolefines, such as an ethylene-vinylacetate copolymer (EVA), polyvinyl chloride, A polyvinylidene chloride, polystyrene, polyamide, polyimide, polyamidoimide, Polycarbonate, Polly (4-methylpentene- 1), an ionomer, Acrylic resin, polymethylmethacrylate, acrylonitrile-butadiene-styrene copolymer (ABS plastics), An acrylonitrile styrene copolymer (AS resin), Butadiene Styrene, Polyethylene terephthalate (PET), polybutylene terephthalate (PBT), Polyester, such as polycyclohexane terephthalate (PCT), polyether, Polyether ketone (PEK), a polyether ether ketone (PEEK), Polyether imide, polyacetal (POM), polyphenylene oxide, denaturation polyphenylene oxide, Pori Sall John, polyether sulphone, a polyphenylene sulfide, polyarylate, aromatic polyester (liquid crystal polymer), polytetrafluoroethylene, Various resin materials, such as polyvinylidene fluoride and other fluororesin, or the blended body containing one or more of sorts of these, a polymer alloy, etc. are mentioned. In addition, it can also constitute from various glass materials, a ceramics material, and a metallic material.

[0039]The valve element 5 comprises a spring material (flexible material) in which elastic deformation is possible. As this spring material, for example Crude rubber, polyisoprene rubber, butadiene rubber, A styrene butadiene rubber, nitrile rubber, chloroprene rubber, isobutylene isoprene rubber, Acrylic rubber, ethylene-propylene rubber, hydrin rubber, urethane rubber, Silicone rubber, various rubber materials like fluorocarbon rubber, and a styrene system, A polyolefin system, a polyvinyl chloride system, a polyurethane system, a polyester system, Various thermoplastic elastomer, such as a polyamide system, a polybutadiene system, a transformer polyisoprene system, a fluorocarbon rubber system, and a chlorinated polyethylene system, is mentioned, and 1 of sorts of these and two sorts or more can be mixed and used.

[0040]The valve element 5 is provided with the following.

The base substance part 51 formed in tubed (approximately cylindrical, hollow circle truncated-pyramidal, etc.).

The suppressed area 52 provided so that the lumen of the base substance part 51 might be covered to the end side (end face side) of the shaft orientations of the base substance part 51.

The holding part 53 provided in the other end side (tip side) of the shaft orientations of the base substance part 51.

In this case, as for the base substance part 51, the suppressed area 52, and the holding part 53, being formed in one is preferred.

[0041]As for the outer diameter of the base substance part 51, it is preferred that it is almost fixed along shaft orientations. Since the outer diameter of the base substance part 51 when the base substance part 51 is compressed by shaft orientations and expands the diameter by this becomes small, the covering device 4 can be prevented from major-diameter-izing.

[0042]Although it escapes with outer diameter (mean outside diameter)  $D_1$  of the base substance part 51 and the value in particular that is ratio  $D_2/D_1$ , inside diameter (mean bore diameter)  $D_2$  of space 36, is not limited, it is preferred that it is 0.5-2, and it is more preferred that it is 1-1.2.

[0043]Although the depth (length shown by  $L_1$  in [drawing 1](#) and [drawing 7](#)) in particular of the escape space 36 is not limited, it is preferred that it is 5 mm or less more greatly than 0 mm, and it is more preferred that it is [ 1 mm or more ] 3 mm or less.

[0044]As shown in [drawing 1](#) and [drawing 2](#), the base substance part 51 differs in the size of the inside diameter by the direction. Hereafter, the inside diameter (internal shape) of the base substance part 51 in each section is explained.

[0045][Section shown in [drawing 1](#)] In the section shown in [drawing 1](#), the inside diameter is dwindling the base substance part 51 toward the direction of a tip except for near [ the ] a tip part. If it puts in another way, except for near [ the ] a tip part, the thickness will increase the base substance part 51 gradually toward the direction of a tip. And the inside diameter near the tip part of the base substance part 51 (thickness) is almost fixed.

[0046]Since the thickness by the side of the end face of the base substance part 51 is comparatively thin in this section by such composition, the base substance part 51 has comparatively small flexural rigidity at that end face side. For this reason, when the shell 6 presses the suppressed area 52, the opening of the slit 54 can be certainly carried out by slight thrust. The tip side of the base substance part 51 has comparatively thick thickness, and its flexural rigidity is comparatively large. For this reason, when

connection with the shell 6 is canceled, the stability of the base substance part 51 works greatly, and the slit 54 in which the valve element 5 was restoring and carrying out the opening to the original shape certainly more certainly blockades.

[0047][Section shown in drawing 2] On the other hand, in the section shown in drawing 2 which intersects perpendicularly with the section shown in drawing 1 (making a medial axis into a nodal line), as for the base substance part 51, the inside diameter is almost fixed along shaft orientations. If it puts in another way, in this portion, that thickness of the base substance part 51 is almost fixed along shaft orientations.

[0048]In this section, since the inside diameter by the side of the tip of the base substance part 51 is large, the shell 6 is deeply inserted into the housing 2 by such composition, even when the valve element 5 changes greatly, the inside diameter by the side of the tip of the base substance part 51 does not become [ too little ], and a channel is secured widely enough.

[0049]The suppressed area 52 is formed in the end face side of the base substance part 51 so that the base end of the base substance part 51 may be closed. The suppressed area 52 is a portion which receives thrust from the apical surface 63 of the shell 6.

[0050]The outer diameter of the suppressed area 52 is set up almost similarly to the inside diameter of the narrow diameter portion 42 of the covering device 4, and the suppressed area 52 enters the narrow diameter portion 42 that there is almost no crevice. The outer diameter of the suppressed area 52 is the same as that of the tip part of the shell 6, or its a little large one is preferred. Thereby, when pressed by the shell 6, the suppressed area 52 breaks inside easily and the slit part 54 carries out an opening easily.

[0051]The slit part 54 which penetrates the suppressed area 52 to shaft orientations is formed in the central part of the suppressed area 52. At this embodiment, the slit part 54 comprises infeed (slit) of the shape of a single character formed in the vertical direction to space in drawing 1.

[0052]It is blockaded by the elasticity of the suppressed area 52 and this slit part 54 holds the fluid-tight state (airtight condition), when it is in a natural state (state where external force does not act).

[0053]Direction of the slit part 54 may be formed not only in the direction of a graphic display but in the direction parallel to space in drawing 1 for example. Not only the thing of the composition of a graphic display but the shape of the slit part 54 may be a slit of cross shape, for example.

[0054]On both sides of the slit part 54, the two heights 521 and 521 are formed in the end face side (side which the apical surface of the shell 6 contacts) of the suppressed area 52. Each heights 521 are formed in parallel with the slit part 54 so that the end face side of the suppressed area 52 may be crossed. The heights 521 are projected in the direction of a end face from the end face side 46 of the covering device 4.

[0055]By forming such heights 521, the part serves as a heavy-gage part, and the suppressed area 52 has large flexural rigidity. For this reason, in a natural state, the power of sticking the slit part 54 is large, and fluid-tight nature is high.

[0056]The heights 522 are formed in the apical surface (side which the shell 6 does not contact) of the suppressed area 52. That is, the heights 522 were located in the base substance part 51 of the valve element 5, and are projected to the heights 521 and a counter direction. These heights 522 are making the shape of an approximately hemisphere, and the tip of the slit part 54 is located in the crowning (tip part) of the heights 522. If the pressure in the valve element 5 works to the heights 522 in the state of obstruction of the slit part 54 by forming such heights 522, since the power acts so that the slit part 54 may be stuck, its fluid-tight nature will improve more.

[0057]The holding part 53 is formed in the tip part of the base substance part 51 of the valve element 5. The holding part 53 is provided with the following.

The level difference part 531 formed so that it might extend in a diameter direction from the peripheral part at the tip of the base substance part 51.

The cylindrical sandwiching part 532 formed so that it might extend in the direction of a tip from the periphery edge of the level difference part 531.

The inside diameter of the sandwiching part 532 is larger than the outer diameter of the base substance part 51, is almost the same as the outer diameter of the valve element holding part 34 of the housing body 3, or is set as a little small grade. The outer diameter of the sandwiching part 532 is almost the same as the inside diameter of the major diameter 44 of the covering device 4, or is set as a little large grade.

Although the value in particular that is ratio  $D_3/D_1$ , outer diameter (mean outside diameter)  $D_3$  [ of the sandwiching



part 532 ] and outer diameter (mean outside diameter)  $D_1$  of base substance part 51, is not limited, it is preferred that it is 1.2–2.5, and it is more preferred that it is 1.8–2.2.

[0058]The valve element 5 is certainly (liquid densely [ Especially ]) being fixed to the housing 2, when the sandwiching part 532 of this holding part 53 is pinched by the valve element holding part 34 of the housing body 3, and the major diameter 44 of the covering device 4.

[0059]The shell 6 is the part or instrument connected to the end connection (narrow diameter portion 42) of the connector 1. As the shell 6, tubular instruments, such as a hub which became independent in itself (part which connects a needle tube), a sheath, etc., are mentioned, for example. [ tip projection / of a syringe (injector) ]

[0060]The shell 6 is provided with the following.

The approximately cylindrical inner portion (container liner) 61.

The approximately cylindrical lateral part (outer case) 62 provided in the periphery side of this inner portion 61 in same mind.

[0061]The inner portion 61 has the fluid channel 611 inside, and the peripheral face is making lure tapered shape. That is, the outer diameter at the tip of the shell 6 is more slightly [ than the opening diameter (diameter of an end connection) of the narrow diameter portion 42 of the covering device 4 ] small, the tapered shape which an outer diameter increases gradually toward the direction of a end face is made, and the outer diameter of the end face of the shell 6 is larger than the opening diameter of the narrow diameter portion 42. The tip of the inner portion 61 is further extended and provided in the direction of a tip from the tip of the lateral part 62.

[0062]The lateral part 62 is a portion used as a lure lock part, and the spiral screw thread (lure lock screw) 621 is formed in the inner skin.

[0063]In order to connect the shell 6 to the connector 1, while making the inner portion 61 insert in the narrow diameter portion 42, the screw thread 421 of the covering device 4 is made to screw in the screw thread 621, and is locked.

[0064]In this invention, the lateral part 62 and its screw thread 621 may be omitted. In this invention, the outer diameter of the inner portion 61 may be constant to shaft orientations (longitudinal direction).

[0065]As a component of the shell 6, the thing quoted by the component of said covering device 4 and the housing body 3 and the same thing can be used.

[0066]Next, connection with the shell 6 of the connector 1 mentioned above is explained. First, as shown in drawing 1, it positions so that the medial axis of the shell 6 and the medial axis of the housing 2 may be coincided, and the shell 6 is moved in the direction of a tip (direction shown by a figure Nakaya seal) from this state, and it inserts into the connector 1.

[0067]Drawing 4 shows the state where the apical surface 63 of the shell 6 was moved to the position of the end face side 46 of the housing 2 (covering device 4). In this state, the valve element 5 is compressed by shaft orientations by pushing on the apical surface 63 of the shell 6 the heights 521 of the valve element 5 projected in the direction of a end face from the end face side 46. Thereby, the base substance part 51 is expanding the diameter slightly especially in pars intermedia.

[0068]The center section 523 is slightly displaced in the direction of a tip, and the suppressed area 52 is changing so that the angle (angle which the suppressed area 52 and the base substance part 51 make) of the corner 524 near a periphery may become small. Thereby, the tip end part is opening slightly the slit part 54 blockaded till then. At this time, by forming the heights 521, modification of the suppressed area 52 acts like the lever which makes a power point and the corner 524 a fulcrum and with which it makes the center section 523 a pressure cone apex for the heights 521, and is produced. For this reason, since the displacement to the direction of a tip of the center section 523 becomes larger than the displacement to the direction of a tip of the heights 524, the slit part 54 carries out an opening more greatly.

[0069]Since the narrow diameter portion 42 is entered, the breadth (diameter expansion) to the diameter direction is regulated by the narrow diameter portion 42 of the covering device 4, and the base end (suppressed area 52) of the valve element 5 has still closed the end face side of the slit part 54.

[0070]If the shell 6 is further moved in the direction of a tip and it inserts into the connector 1, it will be in the state which shows in drawing 5.

[0071]The tip of the shell 6 enters in the covering device 4, and drawing 5 shows the state where the apical surface of the lateral part 62 and the end face side 46 of the covering device 4 were mostly in agreement. In this state, by the shell 6, the suppressed area 52 was pushed in the direction of a tip, and is contained in the medium diameter portion 43. Thereby, it enables the suppressed area 52 to cancel regulation of diameter expansion by the narrow diameter portion 42, and to spread in a diameter direction.

[0072]The valve element 5 is further compressed by shaft orientations, the diameter of the base substance part 51 is expanded further, and it is making what is called barrel type shape. The base substance part 51 which changed in this way is acting on the suppressed area 52 power (to diameter direction) which is pulled to the periphery side. The suppressed area 52 has spread in the diameter direction with this power (going to the periphery side). Thereby, the whole carries out the opening of the slit part 54, and the channel of the shell 6 and the channel of the connector 1 are opening it for free passage.

[0073]The gap 47 is fully secured to diameter expansion of the base substance part 51. The tip part (part by the side of the holding part 53) of the base substance part 51 moved in the direction of a tip slightly, and has entered the escape space 36.

[0074]When the shell 6 is rotated from this state clockwise (arrow direction in drawing 5) to the connector 1, the screw thread 621 of the lateral part 62 of the shell 6 screws in the screw thread 321 of the housing body 3, the shell 6 (inner portion 61) progresses in the direction of a tip further, and the shell 6 is locked to the connector 1. Drawing 6 shows the state where the shell 6 was locked to the connector 1 in this way (this state is hereafter called "connected state"). In this state, further, when the inner portion 61 of the shell 6 has fitted into the narrow diameter portion 42 of the covering device 4, the shell 6 is more certainly connected to the connector 1.

[0075]The apical surface 63 of the shell 6 is attained till the middle of the medium diameter portion 43, and, thereby, the valve element 5 is further compressed by shaft orientations. and the length of the shaft orientations of the valve element 5 — the original length — it is a half grade mostly.

[0076]The opening of the slit part 54 is carried out still more greatly from the state shown in drawing 5. The part (part by the side of the holding part 53) by the side of the tip of the base substance part 51 and a part of holding part 53 (level difference part 531) have entered the escape space 36. If it says in more detail, the tip part of the valve element 5 moved in the direction of a tip greatly, and is contained in the escape space 36. The level difference part 531 escaped so that the valve element holding part 34 might be approached, and it has entered the space 36, and the angle of the level difference part 531 and the valve element holding part 34 to make is small.

[0077]Thus, the valve element 5 can change in the direction of a tip greatly by forming the escape space 36, The shell 6 can be connected also when the insertion length (length from the end face side 46 of the covering device 4 to the apical surface 63 of the shell 6) of the shell 6 in a connected state shown by  $L_2$  in drawing 6 is long. Therefore, the connector 1 can connect various kinds of shells 6 from which insertion length differs.

[0078]Especially, like this embodiment, in connecting the connector 1 and the shell 6 by screwing of a lure lock screw, need insertion length  $L_2$  for a long time, but. With connection and its release of the shell 6, also in such a case, the valve element 5 operates certainly, and the slit part 54 opens [ according to this invention ] to it and closes certainly.

[0079]The modification flexibility of the base substance part 51 and the suppressed area 52 increases according to it being possible for the part (part by the side of the holding part 53) by the side of the tip of the base substance part 51 and a part of holding part 53 (level difference part 531) to escape, and to enter the space 36. Thereby, the slit part 54 carries out an opening more certainly by a bigger effective area product.

[0080]Since the apical surface 63 or the tip part peripheral face 64 of the shell 6 do not invade in the fluid channel of the housing 2 more than the valve element 5 when connecting the shell 6 to the connector 1 as shown in drawing 6, the inconvenience that the slit part 54 can extend too much and causes the fall of fluid-tight nature does not arise. Even when foreign matters (garbage, dust, etc.), bacteria, etc. have adhered to the apical surface 63 and the tip part peripheral face 64 of the shell 6, they are prevented from they invading in the housing 2 and polluting the inside of the housing 2.

[0081]Since the shell 6 is rotated counter clockwise, a lock is canceled of the connected state shown in

drawing 6, and the thrust by the shell 6 which was acting on the valve element 5 will be canceled if it moves in the direction of a end face further and draws out from the connector 1, the base substance part 51 is extended to the original length according to the self restoring force according [ the valve element 5 ] to the elasticity. And the suppressed area 52 of the valve element 5 returns to the original shape, and enters in the narrow diameter portion 42 of the covering device 4, and the heights 521 project it from the end face side 46, and it will be in the state which shows by drawing 1.

[0082]If the valve element 5 returns to the original shape, the fluid will be prevented from flowing out of the end face side of the connector 1, even if a fluid flows backwards in the direction of a end face, for example after extracting the shell 6 from the connector 1 since the slit part 54 is blockaded again and fluid-tight nature is recovered.

[0083]Especially when the slit part 54 is formed in the heights 522 which are heavy-gage parts like this embodiment, Since it can compare when the slit part 54 is formed in a plate-like portion, and the sealing nature at the time of the blockade of the slit part 54 can be improved more, liquid leakage can be more certainly prevented to the rise of the internal pressure of the housing 2, etc.

[0084]Since the shell 6 penetrates the slit part 54 of the valve element 5 and is not connected as the connector 1 was mentioned above, Even when the slit part 54 cannot extend superfluously and it carries out as a result by repeating attachment and detachment of the shell 6 to the connector 1 many times, the sealing nature in the slit part 54 of the valve element 5 hardly falls.

[0085]

[Example]Then, the concrete example of this invention is described.

[0086]The above-mentioned connector 1 was applied to a part of Y site used as a chemical-feeding mouth of a medical-application infusion set.

[0087]The valve element 5 of the shape shown in drawing 1 thru/or drawing 3 was manufactured with silicone rubber, and in consideration of the inside diameter and length of a syringe (shell 6), the slit part 54 of the shape of a single character whose length in plane view (drawing 3) is 2 mm was formed so that the central part of the suppressed area 52 of the valve element 5 might be penetrated.

[0088]In the formation point of the heights 521 which are pressing hard most, the thickness of the suppressed area 52 of the valve element 5 was 1.8 mm 1.2 mm in the formation point (center section 523) of the heights 522 which become thickness most.

[0089]The height (overall length) of the valve element 5 was 9.4 mm. Outer diameter  $D_1$  of the base substance part 51 set 4.0 mm and outer diameter  $D_3$  of the sandwiching part 532 to 8.0 mm.

[0090]In the section shown in drawing 1, it was referred to as 0.5 mm (minimum) by the end face of the base substance part 51, and the thickness of the base substance part 51 was 1.0 mm (maximum) at the tip, and was gradually changed by the meantime. And in the section shown in drawing 2, it could be 0.6 mm uniformly along the shaft orientations of the base substance part 51.

[0091]Injection molding of the covering device 4 and the housing body 3 of shape which are shown in drawing 1 and drawing 2 was carried out with polypropylene, respectively. The inside diameter of the narrow diameter portion (end connection) 41 of the housing 2, the medium diameter portion 43, and the major diameter 44 was 4.0 mm, 6.2 mm, and 7.8 mm, respectively. Inside diameter  $D_2$  of the escape space 36 could be 5.0 mm.

[0092]And after equipping the covering device 4 with the valve element 5, it fitted in so that the housing body 3 might be closed to the covering device 4, and the housing body 3 and the covering device 4 were adhered by ultrasonic welding. The valve element 5 was certainly fixed to the housing 2 by pinching the sandwiching part 532 between the housing body 3 (valve element holding part 34) and the covering device 4 (major diameter 44).

[0093]When the tip projection (lure taper: stitch unequipped) of the syringe was inserted in the end connection (narrow diameter portion 42) of the connector 1 assembled as mentioned above, the suppressed area 52 of the valve element 5 was pressed by the apical surface 63, and as shown in drawing 6, the valve element 5 carried out elastic deformation.

[0094]As a result, though the tip part peripheral face 64 grade of the tip projection of a syringe was polluted with bacteria, such as a settling microbe, the danger that a settling microbe etc. would invade directly in the infusion solution passage of the connector 1 was able to be reduced.

[0095]After pouring in a drug solution via a syringe, when the syringe was drawn out from the connector 1, the valve element 5 was restored to the original shape, it certainly blockaded and the slit part 54 regained fluid-tight nature.

[0096]Next, the air leakage test of the valve element 5 was done by the following methods. After the slit part 54 of the valve element 5 had blockaded, the connector 1 was sunk underwater, compressed air was supplied in the housing 2 of the connector 1, and it pressurized gradually. As a result, the air leak from the slit part 54 was not generated until the pressure in the housing 2 reached 0.38MPa.

[0097]Next, when repetition attachment and detachment are performed 200 times as the tip projection of a syringe is mentioned above to this connector 1, and the same air leakage test as that account of back to front is done, a pressure until an air leak arises is 0.38MPa.

Hardly producing the sealing nature (fluid-tight nature, airtightness) fall of the valve element 5 was checked.

[0098]As mentioned above, although the connector of this invention was explained based on one embodiment of a graphic display, etc., Composition of each part especially shape of a valve element, structure and the shape of housing, structure, etc. can be made into the arbitrary things which can attain the same function by not limiting this invention to this, and various modification following, for example is possible.

[0099]– The valve element 5 may consist of two or more sorts of spring materials in which a presentation differs from the characteristics (pliability, the rate of bending flexibility, rubber hardness, etc.).

[0100]In said embodiment, although the valve element 5 and the housing 2 were used as the separate member, what formed the valve element 5, the covering device 4 or the valve element 5, and the housing body 3 in one by 2 color shaping, insert molding, etc. may be used, for example. Thereby, reduction of part mark can be aimed at.

[0101]– The internal shape of the base substance part 51 of the valve element 5 may be the shape (cylindrical shape, truncated cone form, etc.) which does not change to the circumference of a medial axis not only in the thing of a graphic display, for example.

[0102]– Although the slit part 54 mentioned the thing of the shape of a single character, and cross shape, they may be shape, such as the shape of an L character, the shape of an H character, and a U shape, for example. When it is necessary to fluctuate the fluid flow according to a use, two or more slits may be provided in the slit part 54.

[0103]– Although the example which formed the base substance part 51 of the valve element 5 in cylindrical shape was given in the aforementioned embodiment, the bellows shape portion which has a spring function may be provided so that shape may revert easily.

[0104]

[Effect of the Invention]As stated above, according to this invention, since it is not the structure which makes the valve element of a connector penetrate a shell and is connected, the foreign matter adhering to the tip part of the shell, bacteria, etc. are prevented from invading in a connector.

[0105]The flexibility of displacement and modification of a valve element increases by providing the escape space of the valve element. thereby — insertion length — merits and demerits — to various kinds of various shells, the valve element operates certainly, and a slit part opens with those connection and its release and closes certainly.

[0106]Since a shell is certainly connected to a connector, separating unwillingly from a connector is prevented.

[0107]This fluid can be prevented from beginning to leak from a valve element out of a connector, even when a fluid flows backwards, for example since a slit part is certainly blockaded even after removing a shell from a connector.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1]It is drawing of longitudinal section showing one embodiment of the connector by this invention.

[Drawing 2]It is drawing of longitudinal section in the section of drawing 1 of the connector shown in drawing 1, and the section which intersects perpendicularly.

[Drawing 3]It is the top view which looked at the connector shown in drawing 1 from the end face side.

[Drawing 4]It is drawing of longitudinal section showing a state when the apical surface of a shell is abbreviated—in agreement with the end face side of housing.

[Drawing 5]The tip part of a shell is drawing of longitudinal section showing the state where it was inserted into the housing of a barrel.

[Drawing 6]It is drawing of longitudinal section showing the state where connection with the connector of a shell was completed.

[Drawing 7]It is drawing of longitudinal section showing other embodiments of the connector of this invention.

### [Description of Notations]

- 1 Connector
- 2 Housing
- 3 Housing body
- 31 Inner portion
- 311 Channel
- 32 Lateral part
- 321 Screw thread
- 33 End face side
- 34 Valve element holding part
- 35 Slot
- 36 Escape space
- 4 Covering device
- 41 Lobe
- 42 Narrow diameter portion (end connection)
- 421 Screw thread
- 43 Medium diameter portion
- 44 Major diameter
- 45 Taper part
- 46 End face side
- 47 Gap
- 5 Valve element
- 51 Base substance part
- 52 Suppressed area
- 521 Heights
- 522 Heights
- 523 Center section
- 524 Corner

53 Holding part  
531 Level difference part  
532 Sandwiching part  
54 Slit part  
6 Shell  
61 Inner portion  
611 Channel  
62 Lateral part  
621 Screw thread  
63 Apical surface  
64 Tip part peripheral face

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[Translation done.]

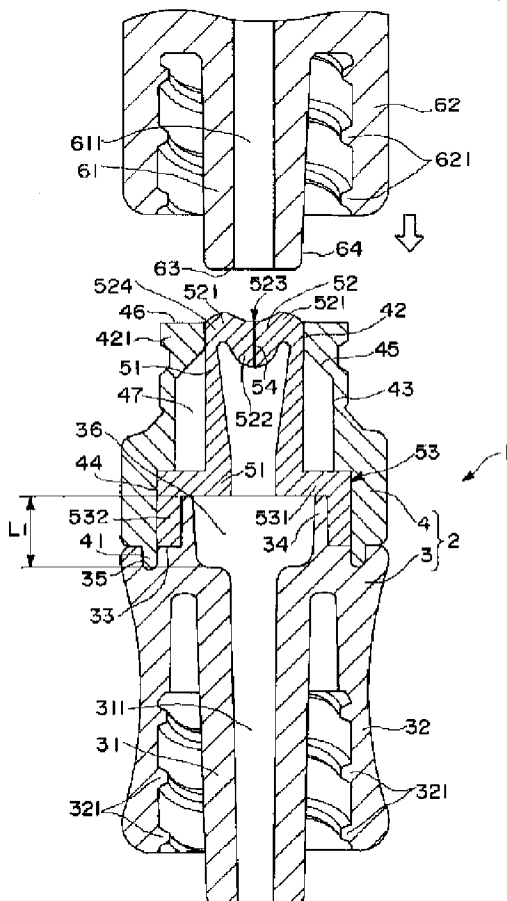
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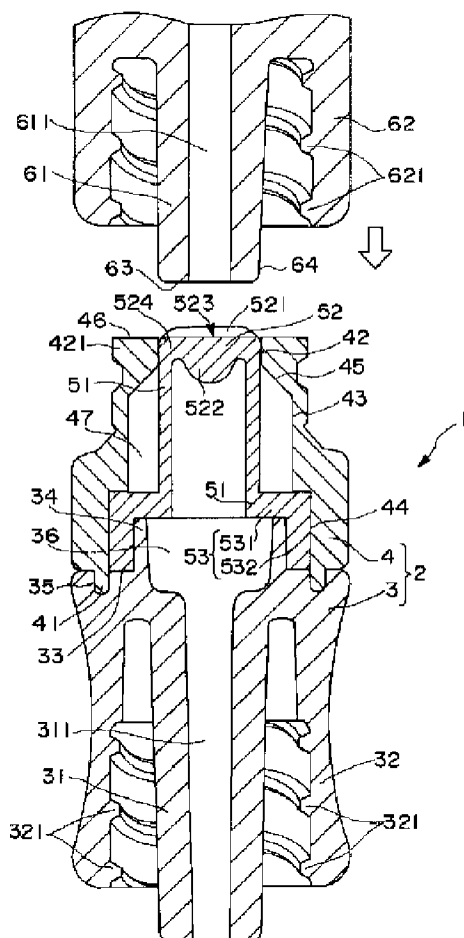
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## DRAWINGS

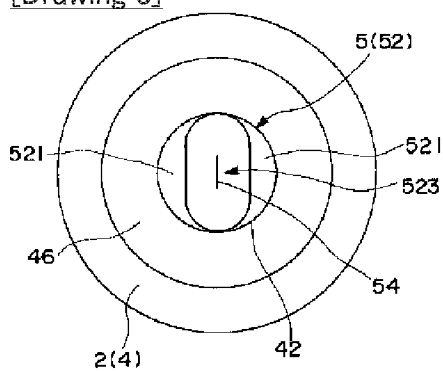
[Drawing 1]



[Drawing 2]

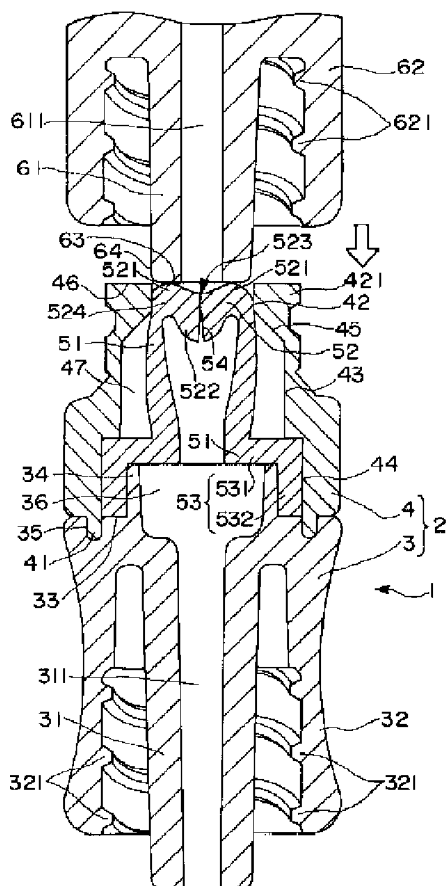


[Drawing 3]

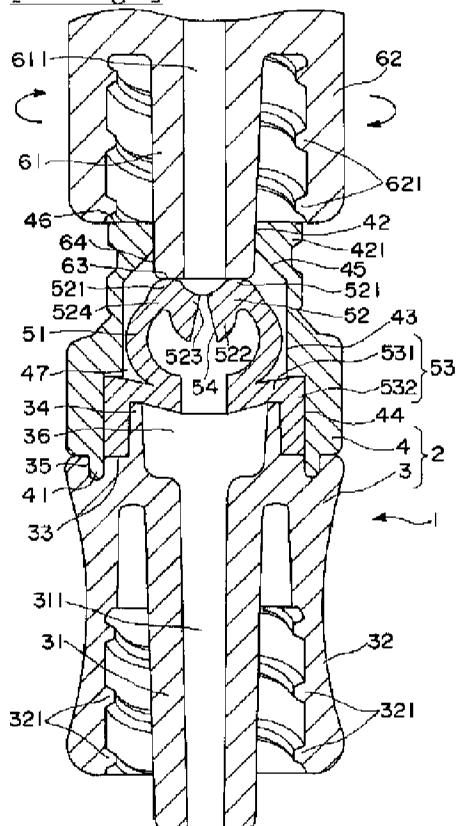


[Drawing 4]

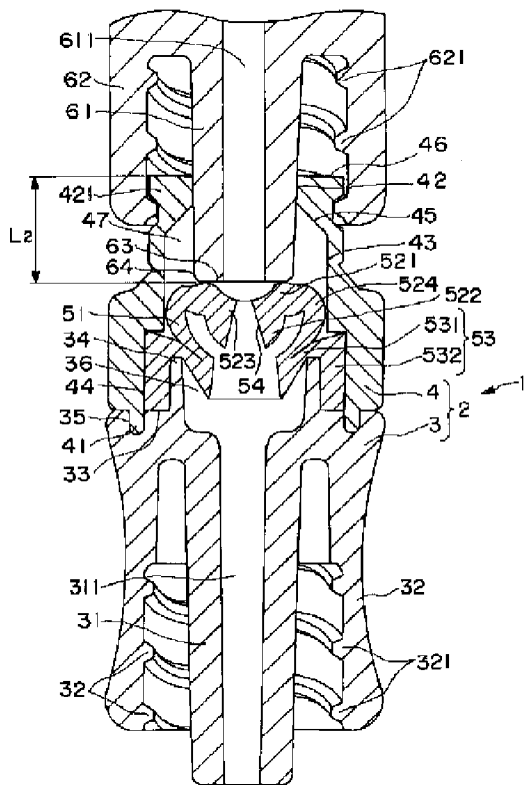




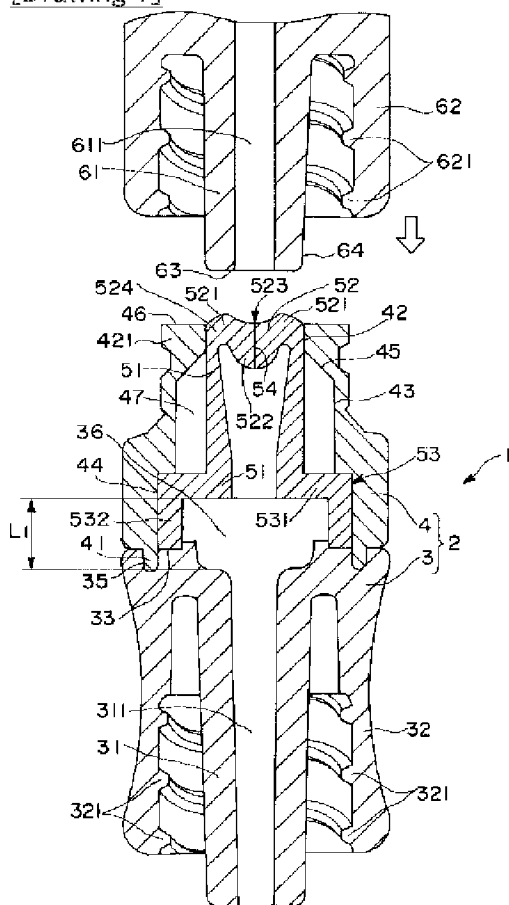
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]